Art. XVI.—*On Nepharis and other Ants' Nest Beetles taken by Mr. J. C. Goudie at Birchip.*

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(Communicated by J. A. Kershaw, F.E.S.).

(With Plate XXVII.).

[Read 13th October, 1904].

Mr. J. C. Goudie, of Birchip, in the Mallee district, of north-west Victoria, has recently been paying considerable attention to ants' nests, with the result that he has obtained many singular forms of beetles in them. All these he has allowed me to see, and of most species has been able to spare several specimens. The collection he has already made is so rich in peculiar forms that I thought a paper containing descriptions of the new species, with notes on the previously described ones, would be of interest. The types of all the new species, and specimens of most of the others, and of two kinds of ants, have been placed in the National Museum, Melbourne.

Some general remarks on ants' nest beetles may not be out of place here, as I have myself paid considerable attention to the nests of ants and termites in many parts of Australia, and have taken many anomalous beetles in them.

On examining a collection of such beetles one cannot help but noticing the large proportion of species having less than the usual number (11) of joints to each of the antennae. The next most noticeable feature is the frequency with which the prothorax is deeply and often very peculiarly sculptured; whilst another peculiarity is the method (usually by ridges or grooves) by which the appendages are protected. In many of the species, moreover, the buccal appendages are often very small, and in some of them quite invisible. In Australia (including Tasmania) but one blind ant's-nest beetle (Tasmanica myrmecophila, Lea) is known, but many are known from Europe and North America.

The beetles more commonly found in ants' nests belong to the families Pselaphidae and Scydmaenidae. In fact, there are but few nests of many kinds of ants that on careful examination will not be found to contain specimens of one family or the other. The genus Articerus, of the former family, contains a larger number of species than any other genus of beetles found with ants in Australia, and specimens of it are sometimes found associated with termites as well; it is readily recognised by its one-jointed antennae. Representatives of its sub-family (the Clavigerides) occur in ants' nests all over the world, and many of them, including several blind genera, are remarkably formed. There are, however, hosts of species to be taken in ants' nests, and probably more than half of the whole family (a large one in Australia) are to be so taken, although many of the species hitherto described have not been so recorded, having been taken during floods, or at sunset on tops of fences, etc., when they have come out to pair. The allied family Scydmaenidae is also rich in species, which occur in ants' nests. The members of both these families are certainly welcomed by the ants, and I have on several occasions seen species of each carrying off Acaridae, which often abound in the nests of ants, and cannot but be injurious to them.

On the other hand, the sculpture of the species of Nepharis and Kershawia is such as to leave no doubt but that they prey upon the ants, and that these are hostile to them; every one of their appendages is admirably protected, the antennae and all parts of the legs fit into appropriate grooves, and even the eyes are protected by tubercles or ridges at their sides, and are unusually small.

The Ptinidae (all of which are apterous) move about very deliberately in the nests, and are apparently untouched by the ants, but they can scarcely be welcome visitors, to judge by the smallness of the palpi and the way their legs are grooved.

There are many species of Staphylinidae to be taken in nests of both ants and termites; of the species known to me most belong to Dabra or to allied genera, but there are several very anomalous forms. Several British species of the family are supposed to be kept as slaves by ants.

One would hardly expect a beetle of the genus Lagria to be found with ants, but I have on several occasions seen a species (formicicola, Lea) of that genus in ants' nests, and of more than one kind of ant; one, indeed, being the ferocious bull-dog ant (Myrmecia sp.), the nests of which, for prudential reasons, one does not care to too critically examine.

Several species of Carabidæ are to be seen in ants' nests, but (except Adelotopus fasciatus, Cast., which is slow moving) they can seldom be taken, owing to the extreme rapidity of their movements, in this respect being second, perhaps, to no other insects in Australia.

Trichopterygidae are to be seen in the nests of some kinds of ants, sometimes hundreds of specimens being in one nest under a stone; they are all fairly fast in their movements, but do not seem to be unfriendly to the ants.

Several species of Arthropterus of the Paussidae are to be taken in ants' nests, and these (judging by other genera of the family which are found with ants) are probably hostile. They all can discharge a stinging vapour from the anus, much as do the Brachinides (Pheropsophus, etc.).

Most of the species of Cryptodus (Scarabaeidae) are to be taken in ants' nests, and all the species have the mouth parts specially protected.

Besides beetles, there are many very peculiar insects to be taken in ants' nests all over Australia. A small cockroach and a small pallid cricket are fairly common. A pale, yellowish, swift-moving silver-fish is very common (possibly there are several congeners). Spring-tails are represented by many species. A number of Hymenoptera are truly parasitic, in their larval stages, on the ants, including species of the remarkable family Mymaridae (of this family I have taken a species, having but two wings, in Tasmania). One Hymenopterous insect, common in ants' nests under stones in Tasmania, is apterous, and with a very peculiar abdomen. Coccidae of the genus Dactylopius and allied genera, abound, being usually seen in the nests attached to roots of grass. Several species of Aphides (so frequently commented on as the "cows" of the ants) are to be taken, and a number of Lepidopterous larvae. Acaridae of many sorts are to be seen, both running about the nests and attached to the bodies of the ants themselves.

The ants, in the nests of which Mr. Goudie found beetles, are Crematogaster laeviceps, Sm., and Iridomyrmex nitidus, Mayr. Mr. W. W. Froggatt (to whom I am indebted for the names) writes me that both are common in New South Wales, about Sydney, and occur also at the Murray River and Bombala. Of the ants Mr. Goudie says:—

"Both the species of ants live, for the most part, in or under dead timber lying on the ground, which has previously been hollowed out by termites; when they get the chance they will kill and eat these latter. In most cases they have holes in the ground under the stick or log, but they do not seem to make much use of them. Their eggs, larvae and winged sexes are often found packed in thousands in a bit of wood a yard long and three or four inches thick, and I have always got the beetles by splitting open the wood; these are generally found in little clusters in the thickest mass of the ants, but nearly always clinging to the solid wood. All the Nephares creep about very slowly and awkwardly."

The beetles occur with the ants as follows:

With *Crematogaster laeviceps*, Sm.

Articerus fortnumi, Hope.
Articerus gibbulus, Sharp (?)
Nepharis goudiei, Lea.

With *Iridomyrmex nitidus*, Mayr.

Dabra myrmecophila, Oll.
Articerus curvicornis, Westw.
Articerus regius, King.
Articerus gibbulus, Sharp (?).
Heterognathus carinatus, King.
Nepharis costata, King.
Nepharis alata, Cast.
Kershawia rugiceps, Lea.
Diphobia familiaris, Oll.
Paussoptinus laticornis, Lea.
Tribolium myrmecophilum, Lea.
Cordus hospes, Germ.

HYMENOPTERA.

Formicidae.

Crematogaster laeviceps, Sm.

(Plate XXVII., Fig. 2.)

This is a small ($3\frac{1}{2}$ mm. in length) reddish-brown ant, with a black, heart-shaped abdomen, and the metathorax with an acute spine on each side.

Iridomyrmex nitidus, Mayr.

(Plate XXVII., Figs. 1, 10 and 11.)

This is a somewhat larger (5 mm. in length) ant, its metathorax without spines and its abdomen oval. Mr. Goudie has sent me winged forms of both the male and female, together with some larvae and pupae.

COLEOPTERA.

Staphylinidae.

Dabra myrmecophila, Oll.

A specimen from Mr. Goudie agrees very well with the description of this species, hitherto known only from Western Australia, where it occurs also in ants' nests.

Mr. Goudie has taken another and a very remarkable species of Staphylinidae, apparently belonging to a new genus near Bledius; but as he has seen but one specimen, I prefer to leave it undescribed at present.

Pselaphidae.

Articerus fortnumi, Hope.

Readily distinguished by the antennae, which "are straight, rather longer than the head, and somewhat narrowed in the middle." It was originally described from Adelaide, but, besides Birchip, occurs also in New South Wales.

Articerus curvicornis, Westw.

Originally recorded from ants' nests in Melbourne. Mr. Goudie has correctly mated the specimens sent to me; the female has much shorter and less curved antennae than the male. The species occurs also in New South Wales, South Australia and Tasmania.

It is the only species of its genus known to me from Tasmania, where it occurs in the nests of Iridomyrmex gracilis, Loun.[1]

Articerus regius, King.

Mr. Goudie has given me a specimen which appears to be a female of this species. It is, at any rate, the only one I have seen having both the prothorax non-foveate and the antennae long. King's specimens were from Liverpool (N.S. Wales) and "ants' nests in wood."

Articerus gibbulus, Sharp. (?)

Mr. Goudie has given me specimens of a species which has the metasternum and middle tibiae as described in the male (the only sex known to Sharp) of this species. The antennae of the Birchip specimens, however, are quite strongly curved at the base (more strongly and regularly than in curvicornis), whilst Sharp says of gibbulus "antennis cylindicis apicem versus incrassatis, apice truncato"; and, again, "The antennae are moderately long, distinctly longer than the head, slender at the base, rather stout at the abruptly truncate extremity." I have not ventured to describe the species as new, however, as the curvature of the antennae, strong as it is, is not noticeable from certain directions, and many of the species of the genus are very widely distributed.

The female of the Birchip species has the metasternum and middle tibiae normal, and the pygidium not impressed.

Mr. Goudie also sent to me for examination several other species of Pselaphidae that were taken by him in ants' nests,

1 I am indebted to Mr. Froggatt for the name of the ant.

but as they were unique specimens, and unknown to me, they were returned, and I unfortunately omitted to note the genera they belonged to.

Scydmaenidae.

Heterognathus carinatus, King.

Described by King from Parramatta, where his specimens occurred "in the nest of small black ants." Mr. Goudie's specimens were taken in the nests of Iridomyrmex nitidus.

The species is distinguished from all its described congeners by the prothorax having a short longitudinal carina at the base, on each side of which is a transverse impression. A closely allied species (perhaps a variety) occurs in Western Australia, in the nests of ants and termites.

Colydiidae.

Nepharis alata, Cast.

(Hiketes thoracicus, King).

(Pl. XXVII., Fig. 5).

Described by both Castlenau and King from specimens taken by Mr. George Masters in an ants' nest at King George's Sound; King did not specify the ant, and I have not seen Castlenau's description. Mr. Goudie appears to have taken a greater number of specimens of it than of either of its congeners.

Nepharis costata, King. (Pl. XXVII., Figs. 4, 8).

Specimens taken by Mr. Goudie agree exactly with two in my collection which were taken by the late Rev. R. L. King at Liverpool, in New South Wales.

Nepharis goudiei, n. sp. (Pl. XXVII., Figs. 3, 9).

Narrow, flattened, reddish-brown, subopaque, glabrous.

Densely covered all over with rather large shallow punctures, smaller on the elytra and coarser on the under surface of the head than elsewhere. Head about once and one-half as long as

wide; with four strong, longitudinal, paralled carinae; apex distinctly notched; sides towards base with several lateral projections. Eyes very small and indistinct, invisible both from above and below. Antennae short, cylindrical, inserted one-third from apex of head, not extending to prothorax, joints very indistinct. Submentum soldered to the head. Prothorax not much longer than head, convex along middle, sides flattened and strongly serrate. Scutellum very short and strongly transverse. Elytra scarcely wider than prothorax, disc convex, and each with four costae, of which only the outer is very distinct, the others (and especially the one near the suture) being but little elevated; costae separating double rows of punctures; sides flattened from base to apex; apex rather deeply notched. Legs short; femora very stout; tibiae dilated towards and obliquely cut off at apex; tarsi (except claw-joint) thin. Length, $2\frac{1}{2}$ mm.

Hab.—Birchip. In nests of Crematogaster laeviceps.

The two median carinae of the head are very distinct from their base to about one-third from their apex, at their base each is feebly bifurcated. The eyes are very small, and it was some time before I could satisfy myself that the species had any at all. The antennae are not clubbed, and, in fact, appear to be perfectly cylindrical throughout, the joints being nowhere distinctly defined, and but for shades of colour (not visible from some directions) marking the junctions of the joints, would appear as if each was composed of but one long cylindrical joint. I have been able to count but eight joints altogether (of which the terminal one is longer and paler than the others), but it is quite possible that there are more.

In the previously described species the piece called by King the submentum is notched behind, and when seen from the sides appears as a kind of flap, which is distinctly separated from the head; but in this species, although slightly notched behind, it forms part of the head itself. This, with the shape of the head, the peculiar antennae and the non-carinate prothorax, might be regarded as causing the species to be generically distinct; but I do not consider it advisable to propose a new genus for its reception, as it is not reasonable to expect uniformity of characters in species leading such abnormal lives as do these insects.

I have not been able to manipulate the legs of any of the specimens of Nepharis so as to be able to draw them in their natural positions, and so in the figures given they have been left out. The antennae of all three species are not very satisfactorily drawn, and, as a matter of fact, it is almost impossible to count the number of their joints in goudiei, and very difficult in costata.

Kershawia, n. g.

Head large, truncated in front. Eyes small, round, lateral, coarsely faceted. Mandibles strong. Maxillary palpi not distinct, the labial with the terminal joint large and in a groove. Antennae eight-jointed.

Prothorax subquadrate, costate.

Scutellum small, transverse.

Elytra subparallel, not much wider than prothorax, costate.

Prosternum with a parallel-sided, feebly elevated ridge from between coxae to base. Intercoxal process of mesosternum widened and notched in front. Metasternum large. Abdomen rather large, composed of five segments, first and fifth larger than the others, which gradually diminish in size.

Legs short and stout. Four front coxae rather narrowly, the hind pair moderately widely separated. Femora grooved and edentate. Tibiae strongly and almost triangularly dilated outwardly, the dilated portion grooved along its outer edge for the reception of tarsi. Tarsi short, linear, apparently four-jointed, the claw joint as long as the others combined. Claws small and simple.

Body winged.

The eight-jointed antennae with small and lateral eyes and the general sculpture denote an approach to Nepharis. The parts of the mouth are not distinctly visible in the specimens before me, and I am not able to see any of the palpi except the terminal joint of the labial pair.

Kershawia rugiceps, n. sp. (Pl. XXVII., Fig. 6).

Of a rusty brown, and (except for the antennae and tarsi) opaque.

Head roughly punctate, with a number of short, costiform, irregularly placed elevations, of which the longest is on each side, above the eye. Antennae short, first joint as long as second-third combined, but partially concealed from above; second-seventh of equal size and strongly transverse; eighth as long as sixth-seventh combined, and increasing in width to apex, which is truncate. Prothorax subquadrate, apex feebly emarginate, base rounded; with four longitudinal costae all united at the base and apex, the outer ones with rounded corners; surface roughly punctate. Elytra each with five costae, the first short and subsutural, the fourth united with third at about one-third from apex, then united with second at one-fourth from apex, then oblique almost to inner apex; surface roughly punctate, the punctures in two more or less regular rows. Under surface and legs densely punctate, the punctures with a granulated appearance. Length, $3\frac{1}{2}$-$4\frac{1}{4}$ mm.

Hab.—Birchip.[1] In nests of Iridomyrmex nitidus.

The head in front is truncate, then rounded and diminishing to about the middle (where the eyes are situated), then dilated and again diminishing to base. The prothoracic costae divide the prothorax into five almost equal longitudinal spaces. On each side of the prosternum there is an oblique ridge, evidently for the protection of the front legs; the middle legs are protected by a ridge on each side of the intercoxal process of mesosternum; whilst the hind legs are protected by a ridge on each side of the middle of the basal segment of abdomen. The antennae (which reach back to just beyond the apex of prothorax) are evidently protected by being laid back below the lateral cephalic costae, with the terminal joint of each resting between the outer costa of the prothorax and its margin.

In two of the specimens before me the sheath of the penis is exposed, but I can detect no external feature characteristic of sex. The under surface appears to be covered with indistinct scales, but these, even under a fairly high compound power, are never clearly defined, and, in fact, what appear to me to be scales may really be mud.

1 This species was known to the late Rev. R. L. King, although he did not describe it. I have a specimen from his collection (now in the Australian Museum) that was apparently taken at King George's Sound, by Mr. George Masters.

Dermestidae.

Mr. Goudie informs me that he has seen numerous larvae apparently belonging to Anthrenus or Dermestes, in the nests; but as yet has taken no images of the family. I have myself, however, recorded a species of it [Trogoderma (Anthrenus) socium, Lea] from ants' nests near Sydney.

Ptinidae.

Diphobia familiaris, Oll.

This is a common insect in the Riverina districts and in some parts of South Australia, where it may often be taken under the bark of various species of Eucalypti, usually in the company of ants. Apparently, however, it is rare at Birchip.

Paussoptinus, n. g.

Head rather small. Eyes small, ovate and lateral. Clypeus large and triangular. Mandibles short and strong. Palpi not visible with head in position. Antennae large and wide, their bases almost touching, second joint almost entirely concealed.

Prothorax longer than wide, towards base with a strong foveate transverse depression, the sides dentate.

Scutellum absent.

Elytra ovate, soldered together.

Mesosternum slightly notched in front. Abdomen wide, with five segments; third much wider but no longer than fifth, slightly shorter than second, and about twice as long as first; fourth very short and distinctly curved.

Coxae large, four anterior free, all largely excavated to receive trochanters; front pair moderately, middle pair more widely, hind pair very widely separated. Trochanters, especially the hind pair, large. Femora grooved to receive tibiae, edentate. Tibiae somewhat compressed, sides grooved to receive tarsi. Tarsi linear and rather thin, all five-jointed, first moderately long second-fourth diminishing in length, and, combined, as long as fifth. Claws small and simple.

Body apterous.

This genus is proposed to receive a small beetle clearly intermediate between the Paussidae and Ptinidae; several other genera have been noted as connecting links between these two families, but there is none so absolutely convincing as this. The head, prothorax, elytra and abdomen strongly resemble those parts of Diplocotes foveicollis, and the legs are much the same; the two insects, in fact, resemble each other so closely that were the antennae removed they would appear to be very closely allied specifically, much more closely, in fact, than foveicollis to its congener howittanus. The antennae (formally described under the species) resemble those of many species of Arthropterus.

The clypeus (or at least what I presume to be the clypeus, as there is a suture on each side separating it from the cheeks) appears as a ridged triangle, of which the apex almost rests between the basal joints of antennae. The mandibles are strong, almost vertical, and close to the front of the prosternum, so that to see the palpi (if these are at all external) it would be necessary to decapitate a specimen. The parts of the legs are so grooved that they can be fitted closely together; but there are no grooves at the sides of the body to still further protect them; the tibiae are apparently without apical spines or mucros.

Paussoptinus laticornis, n. sp. (Pl. XXVII., Fig. 7).

Chestnut-brown; parts of the head, of the antennae and of the legs, darker. Intercoxal processes and middle of metasternum densely clothed with short golden pubescence; sides of prothorax and sides at base of elytra with a few short hairs; elsewhere almost or quite glabrous.

Head transverse; deeper than long, sides at base projecting; coarsely punctate. Antennae extending to second segment of abdomen; first joint thick, curved and coarsely punctate; second small and invisible except from below; third twice as wide as long, moderately stout, convex in front, with punctures as on first; fourth-eleventh each widely transverse and comparatively thin, closely joined together and shining; fourth concave in front and behind; fifth-eleventh, each concave in front and

convex behind; eleventh narrower than tenth, and with its sides rounded and slightly converging towards apex. Prothorax distinctly londitudinally and obliquely strigose, with a large foveate, submedian impression in the middle of a transverse depression; each side bidentate, the front tooth very acute and almost median, the hind very obtuse and at the other side of the depression. Elytra closely applied to prothorax, and at base very little wider than the base of that segment, widest before the middle; strongly convex, sides and apex rounded; seriate punctate, the punctures sub-oblong and distinct but small, the interstices with feeble seriate rows of sparser and smaller punctures; surface with very indistinct but rather numerous transverse wrinkles. Abdomen densely, longitudinally strigose, with irregular transverse series of not very small punctures. Length, 2-3 mm.

Hab.—Birchip. In the nests of Iridomyrmex nitidus and Crematogaster laeviceps.

This is one of the most interesting insects I have seen. From the side, the fourth-eleventh joints of antennae appear thin but moderately inflated in the middle, so as to have a certain resemblance to the seed pods of certain species of Acacia. In some lights their margins seem to be very finely serrated, but this appearance may be deceptive. The transverse depression of the prothorax divides that segment into two parts, of which the basal is not quite half the size of the apical, and is on a lower level. The regular convexity of the elytra is not interrupted by striae. Some specimens, presumably the females, are larger and wider than others; but there are no distinct external features to be noted as sexual.

Tenebrionidae.

Tribolium myrmecophilum, n. sp.[1]

Comparatively broad, chestnut-brown, slightly shining, glabrous.

1 A specimen of this species was sent to Mr. G. C. Champion for his opinion; of it he wrote:—"Your Tribolium is allied to T. confusum which has the antennal joints becoming gradually wider, but your species is larger, etc., and has a smaller apical joint. T. ferrugineum has a well-defined three-jointed club." There are numerous specimens of this species in the King collection that were probably taken in ants' nests near Liverpool.

Head coarsely punctate; in front and on the flanks finely punctate; flanks concealing two basal joints of antennae; with a distinct transverse impression behind eyes. Antennae short, not extending to base of prothorax; seventh-eighth joints rather strongly transverse; ninth-tenth still more transverse, and, with the eleventh, forming a distinct club; eleventh no longer and decidedly narrower than tenth, its sides rounded and apex truncate. Prothorax moderately transverse, sides rounded, apex gently and continuously arcuate and distinctly narrower than base, base feebly bisinuate; densely and coarsely punctate; with several small, irregular impressions. Scutellum small, distinctly punctate. Elytra very slightly wider than prothorax, with a distinct, though narrow, reflexed margin; epipleural fold distinctly punctate; punctate-striate, sutural striae indistinct but punctures clearly defined; interstices with rather large, sparse punctures. Under surface and legs densely punctate; tibiae stout, each minutely bispinose at apex. Length, $4\frac{1}{2}$ mm.

Hab.—Birchip. In nests of Iridomyrmex nitidus.

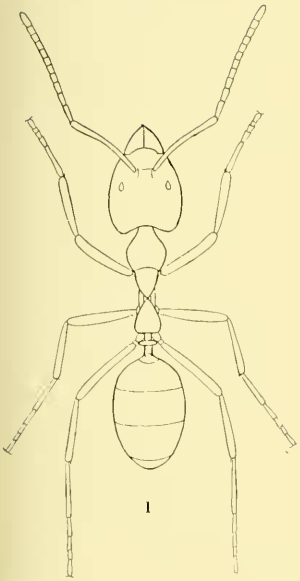
The abdomen is sometimes darker than the upper surface, and the prothorax than the elytra, but the shades of colour are never strongly contrasted. There are usually about six prothoracic impressions, of which four are basal; although sufficiently distinct, they are never sharply defined. I am unable to distinguish the sexes, but some specimens are wider and darker than others.

The species is apparently a common one (Mr. Goudie has sent me 12 specimens) and is readily distinguished from the cosmopolitan confusum and ferrugineum by the small terminal joint of antennae, the much coarser (and on the head not uniform) punctures, wider body, and the apex of prothorax narrower than base. It is about the size and width of Gnathocerus cornutus, but rather darker.

Brenthidae.

Cordus hospes, Germ.

Apparently rare with Mr. Goudie. I have taken it in the nests of termites, as well as in the nests of many species of



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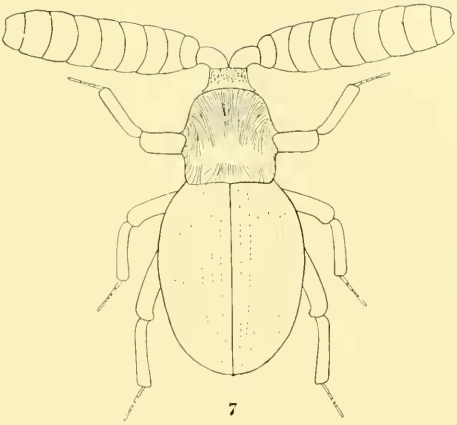

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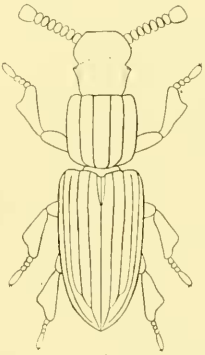

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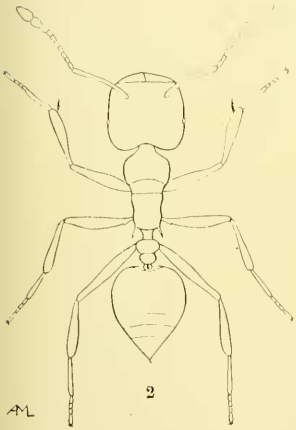

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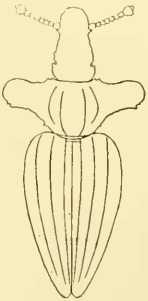

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